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19. ABSTRACT (Continue on reverse if necessary and identify by block number) A review of stress was conducted, with emphasis on organizational, psychological, and medical literature. As a logical extension of the historical development of organizational stress as a concept, a new definition was developed, that of <i>experienced stress</i> , which is the perception of, and response to, environmental influences that impinge on the individual as unpleasant and that produce psychological and physiological outcomes. The relationship of stress to performance in organizations was then discussed. Stress was found to have either a positive, negative, or inverted-U relationship with performance, depending on the type of stress, the kind of performance required, and differences among individuals. Finally, relationships among self-report measures of stress, physiological and psychological indicators of stress, and physiological and psychological outcomes of stress were reviewed. Results of the review indicate that typologies or profiles of individual responses to specific stressful situations could be developed to aid in determining different stress response patterns and predicting susceptibility to illness and disease. It was recommended that research be undertaken by the Navy to determine the relationship between stress and performance in jobs identified as stressful. Eliminating unnecessary stress among its personnel will enable the Navy to perform its mission more effectively.			
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Stress in Organizations: A Review of the Literature

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STRESS IN ORGANIZATIONS: A REVIEW OF THE LITERATURE

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FOREWORD

This review, conducted under Work Unit 521-804-018 (Improving Individual and Unit Productivity), investigates the literature relating to organizational stress. A companion report (NPRDC Tech. Rep. 87-29) examines the relationships among incentive magnitude, perceived stress, job satisfaction, and performance. Other reports prepared under this work unit investigate how monetary incentives affect goal setting and performance (NPRDC Tech. Rep. 87-15), and how task strategies affect performance (NPRDC Tech. Note 72-86-05).

Each of the reports prepared under the above work unit number is intended for use by researchers in the Navy, government agencies, private industry, and the academic community concerned with improving productivity. In particular, this report is intended to provide the reader with a framework through which organizational and individual stress can be understood.

Sincere appreciation is expressed to Dr. Kent S. Crawford for his helpful review of an earlier draft of this report. His comments helped clarify the author's development of the model of organizational stress and its relationship to performance. Appreciation is also extended to Drs. Delbert M. Nebeker and John P. Sheposh for their helpful suggestions of ways to approach this topic.

Requests for further information concerning this review of stress in organizations should be directed to Barrie L. Cooper, Navy Personnel Research and Development Center, AUTOVON 933-6935 or Commercial 619-225-6935.

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SUMMARY

Introduction

A basic aim of organizations is improving efficiency. Attempts to improve individual efficiency have focused on improving performance by motivating employees to expend greater effort. This increased effort can, however, yield undesirable outcomes for the individual, such as illness or disease precipitated by stress. As a result, research on organizational stress has paralleled the increased emphasis on efficiency.

Purpose

The purpose of this technical report is to present a literature review of stress in organizations. Emphasis is placed on developing a definition and model of stress, defining its relationship to performance, and analyzing the relationships among self-report measures of stress, physiological and psychological indicators of stress, and physiological and psychological stress outcomes.

Approach

Organizational, psychological, and medical literature was reviewed for application to three broad areas of stress research: (a) development of the concept of stress in organizations and its reconceptualization as experienced stress, (b) the relationship of stress to performance, and (c) issues in the measurement of stress.

Review and Theoretical Discussion

Stress is a multidimensional construct that does not occur just in the environment or in the individual, but rather is experienced by the individual as a result of the interaction between the individual and the environment. Experienced stress, then, is defined as the cognitive and affective perception of, and response to, the environmental influences that impinge on the individual as being unpleasant or disagreeable, and interact with these perceptions to produce psychological and physiological outcomes.

The review of the concept of role stress explored the merits of role conflict, role ambiguity, and role overload and underload. The construct of person-environment (P-E) fit described in the literature was useful in conceptualizing stress as a mismatch between the individual and the environment. However, persistent problems with the measurement of P-E fit have thus far limited its applicability.

Most research has found that stress and performance form either a positive, negative, or inverted-U relationship, depending on the type of stress, the performance required, and individual differences. One type of job stress about which very little is known is that in which work is characterized by relatively short, intense periods of critical activity. Individuals tend to react to such periods with anger, annoyance, and frustration. Very little research has explored the relationship between stress and performance during these periods of critical activity.

Self-report stress measures relate poorly to physiological indicators of stress because of low reliability and validity of self-report measures and low reliability of physiological indicators. Self-report measures have implicated organizational stress in the development of physical and mental illness. However, self-reports of organizational stress are suspect

due to possible contamination with self-reports of illness and symptoms of illness. Relationships among various physiological measures of stress are often weak and may exhibit different patterns depending on individual differences and types of environmental influence. These findings suggest that typologies or profiles of physiological responses to stress should be developed as an aid in determining individual differences and in predicting illness. Self-report measures have been found to relate to psychological and physiological outcomes.

Conclusions

1. Stress is a multidimensional phenomenon that involves an interplay between the environment and the individual's experience of the environment as stressful.
2. Role stress is a limiting concept in that sources of stress other than role are ignored.
3. Person-environment fit is a highly useful concept for the study of organizational stress because it denotes a mismatch between the individual and the environment. Measurement problems for this concept need to be overcome.
4. The functional relationship between perceived stress and performance depends on the type of performance required, the type of stressful influence from the environment, and individual differences.
5. Self-report measures of stress generally relate poorly to physiological indicators of stress.
6. Self-report measures of stress have been found to predict psychological and physiological outcomes of stress. However, in some cases there may be contamination between these measures.
7. Physiological responses to environmental influences vary as a result of the type of stress encountered and individual differences in perception and response. Physiological measures of stress do not necessarily intercorrelate.

Recommendations

1. Organizational research should be conducted within the Navy to: (a) identify the elements of particular jobs that lead to stress, (b) determine the relationship between stress and performance in these jobs, (c) identify how individuals and organizations adapt to the environment to reduce the stress, and (d) investigate methods of reducing or eliminating dysfunctional job stress.
2. Self-report stress measures should be developed to measure job stress and physiological indicators of stress with greater reliability and to predict psychological and physiological outcomes with greater validity.
3. Research should be conducted to develop typologies or profiles of the physiological indicators of stress based on the type of stress encountered, individual differences in perception and response, and their ability to predict psychological and physiological outcomes.

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INTRODUCTION

Problem and Background

The goal of improving efficiency is a basic aim of nearly all formal organizations, whether they are industrial enterprises, service establishments, or nonprofit organizations. Organizational efforts to improve efficiency have included the use of organization redesign and technological improvements. Attempts to improve individual efficiency have focused on improving employee performance. Generally, this improved performance is gained through motivating employees to expend greater effort.

This increased effort can, however, yield negative outcomes for the individual. As a result, paralleling this interest in efficiency is concern regarding the negative effects of work and the work environment on the employee. These negative effects often take the form of job stress. Organizational researchers, in recognizing these negative effects, have in recent years exhibited increased interest in the study of organizational stress.

Paralleling this research interest is increased emphasis of stress in the popular literature. A recent article in *Time* (Wallis, 1983) highlighted this increased concern. Magazines and newspapers of diverse focus have published articles alerting the public to the problem of stress (e.g., Barnett, 1983; Moe, 1985). *The Wall Street Journal* has printed an impressive array of articles dealing with stress in recent years (Guenther, 1982; "High Stress States," 1983; Ricklefs, 1982; "Stress is More Severe," 1983; Trost, 1985; Waldholz, 1982). These and other articles have helped to make the American public more aware of stress and its effects.

Purpose

The purpose of this report is to review the literature on stress, emphasizing the evolution of the concept of stress in organizational research, the relationship of stress to performance, and the measurement properties of stress. The evolution of the concept of stress will serve as a basis for developing a new definition and model of organizational stress. Then the model will be extended to explore the relationship of job stress to job performance. It is important to understand the stress process as it relates to performance in organizations. It is only through such an understanding that increases in efficiency can be effected without generating dysfunctional stress.

APPROACH

This technical report reviews aspects of stress of interest to organizational theorists, practitioners, and employees. The review consists of three major sections: (a) development of the concept of stress in organizations and its reconceptualization as experienced stress, (b) the relationship of stress to performance, and (c) issues in the measurement of stress. The review concentrates on these aspects because of the importance of modeling and measuring organizational stress and relating it to performance.

The literature for this review is taken from a wide variety of organizational, psychological, human factors, and medical journals, as well as from books dealing with the topic. Primary sources for the initial search were the stress review articles by McGrath (1976), Beehr and Newman (1978), Schuler (1980), and Sharit and Salvendy (1982). From the references these articles provided, further sources were obtained that

provided an almost unlimited listing of articles. In addition, current issues of pertinent journals were scanned. The names of journals scanned is too long to list here, but a perusal of the reference list will give the reader a good indication of the most useful journals. The appendix lists other review articles and books on stress.

REVIEW AND THEORETICAL DISCUSSION

The first three sections of the review are arranged to present the evolution of the stress concept in organizational research. The first topic is role stress, since much of the early research on organizational stress grew out of the concept of organizationally defined roles. A result of role stress research was development of the concept of person-environment fit, which is reviewed next. Then the concept of stress is further developed by weaving together threads from recent research to redefine and build a model of the stress process. Stress is redefined as *experienced stress*, a conceptualization that expands on *perceived stress*, the view that stress occurs as a result of the interplay between environmental influences and the individual's perception of the environment.

The review then shifts gears to examine the relationship between stress and performance, with particular emphasis on stress and performance in organizations. Then follows a short review of stress in jobs characterized by periods of critical, intense activity. The discussion then shifts to consideration of physiological indicators of stress. There is first a review of the relationship between self-report measures of stress and the physiological measures that serve as indicators of stress, followed by a review of interrelationships among physiological measures. The review concludes with a discussion of self-report measures of stress as predictors of negative physiological and psychological outcomes.

Development of Organizational Stress Concepts

Much of the early work on stress in organizational environments concentrated on elements of role stress. The term *role*, borrowed from the performing arts, has been used with various shades of meaning by anthropologists, sociologists, and social psychologists (Sarbin & Allen, 1968; Scott & Mitchell, 1976). With the growing awareness of organizations as environments that define individual behavior, the term *role* was expanded to encompass the formal and informal functions individuals fulfill in performing their work and interacting with fellow employees (Katz & Kahn, 1978; Levinson, 1959; Merton, 1957).

Role Stress

The elements of role stress typically studied have been role conflict and role ambiguity (House & Rizzo, 1972; Kahn, Wolfe, Quinn, Snoek, & Rosenthal, 1964; Rizzo, House, & Lirtzman, 1970) as well as role overload and role underload (Beehr, Walsh, & Taber, 1976; Coburn, 1975; Frankenhaeuser & Gardell, 1976; French, 1974; Sales, 1970). Role conflict as experienced by the employee is defined as the existence of incompatible role, or behavioral, expectations received from one or more sources. Similarly, role ambiguity is defined as the experience of inadequate role definition, or behavioral expectations, from one or more sources (Kahn et al., 1964).

Role overload and role underload can be used as either quantitative or qualitative measures. Quantitatively, role overload as experienced by an employee is defined as a situation in which a set of obligations requires more to be done than the employee is

capable of doing (Sales, 1970). In the qualitative sense, overload is the employee's belief or feeling that the work is too difficult or requires ability beyond what the employee has. In early research, Kahn and his colleagues (Kahn et al., 1964) viewed role overload as a subset of role conflict, but in later work he appeared to adopt the view of Sales (1969b, 1970) that role overload is a separate construct (Kahn, 1974). Quantitative role underload is defined as a situation in which a set of obligations requires less of the employee than the employee is capable of doing. As a qualitative measure, underload is the employee's belief that the work underutilizes his or her abilities.

Role overload was found to correlate with job-related tension (Sales, 1969a) and subjective workload (Sales, 1970). (Subjective workload is the amount of work an individual feels is required by the job.) On the other hand, it was found that those in a role underload condition had less task enjoyment than those in a role overload condition (Sales, 1969a). Lazarus (1971) has suggested that boredom and overload reside at opposite ends of a continuum. Therefore, it is reasonable to conclude that the constructs of role underload and boredom are similar. Frankenhaeuser and Gardell (1976) and French (1974) associated both overload and underload with high stress.

In a meta-analysis of 93 organizational studies of role conflict and ambiguity, Jackson and Schuler (1985) found that both of these variables were positively related to tension and anxiety, and negatively related to all aspects of job satisfaction. Somewhat surprisingly, neither role conflict nor role ambiguity was related to objective ratings of performance with any degree of consistency.

As the above findings suggest, many researchers have refrained from referring to role variables as stress per se, preferring to view them as causes or correlates of organizational stress. Tracy and Johnson (1981) concluded, however, that the most commonly used role conflict scale (Rizzo et al., 1970) is really a role stress scale.

The question of whether role variables measure role stress or merely measure the causes of role stress anticipates to some extent the definition and model developed later in this review. As will be discussed, the answer depends on the viewpoint taken. If these elements are simply measures of perceived environmental conditions, one could possibly say that they are stressful or cause stress, but not that they are stress in and of themselves. On the other hand, if these measures are experienced and evaluated as stressful by employees exposed to such conditions, role variables can be considered elements of stress. In the sense, therefore, that questionnaires measuring role variables require an evaluative response, the variables should be considered stress variables from the respondent's viewpoint.

In light of such a view of role variables, caution should be exercised in interpreting results relating role variables to other elements of stress. Kasl (1978) pointed out a methodological trap that has caught some researchers in role stress studies. Often in research using self-report measures, role variables, such as conflict and ambiguity, are operationalized so that the respondent perceives a predictor variable of conflict or ambiguity to be virtually the same construct as the criterion variable of, say, tension or fatigue. Kasl pointed out research by Lyons (1971), in which the variable role clarity (the converse of role ambiguity) correlated $-.59$ with job tension. An examination of the two scales revealed that they were essentially the same construct. A similar observation can be made of other research cited in this section.

The concept of role logically derives from a utilitarian view of human beings as persons fulfilling a function or obligation, which in the work context is typically defined by the organization. It follows that organizations would be the primary beneficiaries of placing people in roles that eliminate or substantially reduce unnecessary role conflict, role ambiguity, or role overload-underload, that is, role stress that does not further the purposes of the organization. This conception of role, which from the organizational standpoint equates to desired job behavior, leads to the reduction of stress the organization finds undesirable, but may not eliminate stress from the perspective of the individual employee.

Only by designing work that in no way conflicts with or inhibits a person's natural or acquired tendencies or abilities can all work stress be eliminated. Such a proposition is seldom compatible with organizational requirements or objectives, since these objectives generally make use of only a small portion of an individual's capabilities or desires. Nor is total elimination of organizational stress possible or socially desirable, since some optimal level of stress is recognized by proponents of activation theory as desirable and useful (Malmo, 1959; Scott, 1966).

Though the concept of role has value in the study of organizational stress, it is necessarily limiting, since sources of stress other than role are ignored. Kahn et al. (1964), though concerned with role stress, theorized that organizational factors other than role prescription may influence perceived stress in the individual. Therefore, it appears that a broader view of stress would be useful in capturing its meaning.

Person-Environment Fit

The complementary concepts of role overload and role underload connote a mismatch between an individual and the role or job that the individual is expected to fulfill. Due to people's differences in abilities or aptitudes, the same job may be experienced as overload, as a good match, or as underload by different people. In other words, the environment or situation does not entirely define underload or overload. These terms are defined jointly by the individual, the environment, and the interaction between the two (Beehr & Newman, 1978; Lazarus, 1971; McGrath, 1976).

From this realization arose the concept of person-environment (P-E), or person-role, fit (French, 1974; French, Rogers, & Cobb, 1971). From this conceptualization, stress is seen as a lack of fit between the individual and the environment (French, Caplan, & Harrison, 1982). In operationalizing this concept, the respondent usually answers pairs of questions asking first the degree to which a potentially stressful condition exists in the environment, then asking the degree to which the respondent would like it to exist or thinks it should exist. P-E fit is the degree of agreement between the individual's pairs of responses. Often, both objective and subjective measures of the environment and of the individual are obtained (French et al., 1971, 1982), but it has been found that subjective fit is the better predictor of health problems (Coburn, 1975).

P-E fit has been found to be an excellent predictor of several aspects of stress. In a large study of over 20,000 men in 23 occupations, French et al. (1982) found P-E fit accounted for 45 percent of the variance in boredom and workload dissatisfaction, 30 percent of the variance in job dissatisfaction, and lesser but significant amounts of the variance in anxiety, depression, irritation, and somatic complaints. Other researchers found that administrators who had good P-E fit in leadership style and situation control

exhibited less job stress, fewer health problems, and fewer days missed from work than those with poor P-E fit (Chemers, Hays, Rhodewalt, & Wysocki, 1985).

While P-E fit is an attractive way to conceptualize stress, it falls prey to persistent problems with difference scores, which have been criticized for their poor statistical and conceptual properties (Johns, 1981; Wall & Payne, 1973). In research applications, P-E fit measures of stress have not been shown to be consistently superior to the individual's subjective perception of the environment (Caplan, 1972; French et al., 1982). More research needs to be conducted to develop P-E fit measures that do not exhibit the deficiencies of difference scores.

A novel method of measuring P-E fit was used by Furnham and Schaeffer (1984) through the use of Holland's (1973) vocational choice scale. This method, however, requires the inference of congruence between an individual's personality profile and the job that person has. In another study, Chemers et al. (1985) adapted Fiedler's (1967) contingency model of leadership effectiveness to measure P-E fit. An alternative to these methods that avoids the use of difference scores could be to modify the French et al. (1971, 1982) method by first asking the respondent the degree to which a potentially stressful condition exists (as is currently done), followed by the respondent's assessment of this condition as existing to a degree more or less than desired, or about as desired. This method would eliminate the need to use difference scores, because P-E fit would be measured by only the second part of the question. The first part would simply measure the respondent's perception of the environment, as in a conventional perceived stress scale.

Reconceptualization of Stress as Experienced Stress

Subjective measures of the work environment have normally been found to predict stress better than objective measures of the job (French & Caplan, 1972; French et al., 1982; House, McMichael, Wells, Kaplan, & Landerman, 1979). These findings suggest that environmental influences are not in themselves stressful; required in addition are the individual's perceptions and evaluations of these environmental influences. Both conditions are required to generate a feeling of being stressed.

In support of this view, McGrath (1976) stated that "it is not the actual ('objective') danger, or potential hazard, that determines the experience of stress. Rather, it is the person's appraisal or interpretation of the environmental state" (p. 1390). Similar statements have been made recently by other researchers. Shirom (1982) conceptualized stress as the perception of environmental demand as being beyond the individual's ability or resources. Wells (1982) stated that the effect of the environment on the individual is dependent on how it is "experienced and appraised" by that person (p. 80).

As Beehr and Newman (1978) pointed out, physiological and psychological factors can interact to cause health problems. In addition, the interaction between the individual and the environment can also contribute to health problems (Jenkins, 1976). Coburn (1975) determined in a study of Canadian working men that perceived job-worker incongruence predicted poor physical and mental health. Sheposh, Kunkel, and Sprague (1982) found that environmental and personal characteristics influenced the degree and type of perceived stress. This psychological stress response, in turn, had an effect on physiological outcomes as measured by psychosomatic symptoms.

Cherry (1978), on the other hand, in a survey of young working men, found that individual factors (susceptibility to anxiety) and job factors (such as supervising, performing skilled work, interpersonal contact, and driving) contributed essentially independently and equally to the degree of stress reported, with no evidence of interactions. The failure to find an interaction would seem to indicate that either individual or job factors could create job stress in the individual without the presence of the other, but such is not the case. The measurement of stress presupposes the existence of an environment, with individuals existing in that environment as necessary conditions for the development of stress.

In the Cherry (1978) study, in other words, susceptibility to anxiety required an environment that the individual could perceive as anxiety-inducing. The fact that there was no interaction between job and individual factors in this case should not be interpreted as evidence that one factor could induce stress independent of the other. In fact, the term stress has no meaning unless both the environmental influence and the individual response are present.

In a survey of blue collar workers, Wells (1982) found that objective measures of job conditions were significantly, but modestly, related to perceived stress. Such individual characteristics as age and education did not moderate this relationship. Wells emphasized that the relationship between environmental conditions and the perception of stress in the environment is mediated by such factors as the perception of supportive relations. Similarly, Royle (1985) found that social support moderated the relationship between stress and attrition of Marine Corps women. Klein and Ritti (1970) found that the application of work pressure by the supervisor and the perception of pressure by workers were related, though moderately.

A useful conceptualization of the stress process was made by Selye (1976), the endocrinologist who pioneered the study of the physiology of stress. He identified the process as the general adaptation syndrome, consisting of three stages: the *alarm reaction*, the body's first response to the environmental influence, the stage of *resistance*, during which the body mobilizes physical resistance through endocrine secretions, and (if the influence is strong enough and lasts long enough) the stage of *exhaustion*, which leads to physical breakdown or death.

Cox (1985) has stated that there is no physiological stress, that physiological measures are merely correlates of stress. Therefore, the physiological measures that occur concomitantly with the individual's experience of stress will be referred to in this review as physiological correlates or indicators of stress. These indicators of stress correspond to the first stage of Selye's general adaptation syndrome. Behavioral outcomes of stress and longer-term physiological or psychological outcomes of stress that correspond to the second and third stages of the general adaptation syndrome will be referred to variously as outcomes, illness, or disease, as appropriate. Of course, a behavioral outcome of particular interest in this review is performance, which will be discussed later in this review. Psychological and physiological outcomes will also be discussed in a later section.

In his research, Selye (1976) was not particularly concerned with the environmental context of stress, nor did he subscribe to specific outcomes for the individual. This principle of nonspecificity, as he called it, is reflected in his definition of stress as "the nonspecific response of the body to any demand" (Selye, 1976, p. 472). This view of stress as nonspecific has not gone unchallenged. Mason (1975) pointed out that Selye's

formulation is open to serious doubt, referring to technical developments that enable physiological responses to be measured with greater accuracy than could be obtained when Selye formulated his principle of nonspecificity. Similarly, Mikhail (1981) argued against Selye's general adaptation syndrome, pointing to research (Lacey, 1967; Mason, 1971) that found differential patterns of physiological response. Mikhail also raised the issue of varying relationships between psychological and physiological indicators of stress.

Definition of Experienced Stress. In spite of the extensive research on stress in recent years, there is still disagreement as to its definition, as recent reviews have indicated (Beehr & Newman, 1978; McGrath, 1976; Schuler, 1980, 1982; Sharit & Salvendy, 1982; Shirom, 1982). Selye (1976) has admitted causing some of the confusion due to his imperfect understanding of the English language after immigrating to North America from Europe. He used the term "stress" to designate both the causal agent and the bodily effect. More recently he has argued that stress should be considered the effect, and the coined word "stressor" should designate the causal agent (Selye, 1975, 1976). Others (Caplan, 1972; French & Caplan, 1972; French et al., 1982; Hall & Mansfield, 1971), following the model of the physical sciences, have defined stress as the external force and strain as the resulting change in the body.

In deciding what terms to use, one should consider which ones lead to a clearer understanding of the phenomenon being described. Since the objective of this review is to understand what is meant by stress, it appears useful to adopt terms that aid in this understanding. Despite arguments to the contrary (Dohrenwend & ShROUT, 1985), Lazarus and his colleagues have presented compelling arguments that the phenomenon of stress resides neither in the environment alone nor in the individual alone, but is rather the result of an interplay between the individual and the environment (Lazarus, DeLongis, Folkman, & Gruen, 1985). Terms that imply a strict dichotomy between the individual and the environment, as do the terms "stress and strain," and "stressor and stress," tend to obscure the meaning of stress and its process of development. Therefore, the term "environmental influence" will be used to indicate the role of the environment in the stress process. And the term "experienced stress" will be used to delineate the individual's perceptions of, and cognitive and affective responses to, the environmental influences. These terms are intended to convey the interplay between the individual and the environment. The use of either term should imply to the reader the potential existence of the other.

Regardless of orientation, researchers have indicated the importance of the individual's own view of the environment as a determining aspect of stress. Some (e.g., Cooper, Nebeker, & Riedel, 1987; McGrath, 1976; Wells, 1982) have referred to this aspect as the perception of stress, while others (e.g., French et al., 1982; Kasl, 1978; Sales, 1970) have called it subjective stress.

While the view of stress as perceived or subjective stress represents a great advance over earlier views of stress, it appears that the concept can be further clarified. It can be seen from this discussion that it is the act of perception, which is essentially an act of cognition, that has been viewed by many researchers as the primary cause of stress. While it is true that some have included appraisal or interpretation of the perception (McGrath, 1976; Wells, 1982), both of these terms imply the application of rational thought and cognition to the act of perception. These same researchers also stated that stress is dependent on how the individual experiences the environment, but there is no indication that they used the term to indicate a primarily affective or emotional response

to the environmental influence (McGrath, 1976; Wells, 1982). For the most part, those who have conceptualized stress as perceived stress have ignored the affective component of mental activity.

The failure to consider both the cognitive and the affective aspects of the individual's reaction to the environment appears to be an important oversight. Not only is environmental perception important to the stress process; the experience of that perception by the individual through affective, evaluative, and reactive responses is also important.

The inclusion of both the individual's perception and the consequent reaction to the perception requires that stress be redefined. In order to aid this process, earlier definitions of stress were reviewed for applicability. It was found that these definitions contained some aspects that could be used to develop the current definition, and other aspects that could not. These definitions will be discussed below, together with reasons for including or excluding the various aspects.

Schuler (1980), in his review, recognized the multifaceted nature of stress in defining it as a condition in which an individual is faced with either an opportunity, constraint, or demand to be, have, or do what is desired in a situation of uncertainty, which, when resolved, can lead to important positive outcomes for the individual. His use of the term "desire" was deliberate, indicating that individuals have differing values and needs that are not satisfied equally by identical environmental influences. For instance, two researchers could be employed on a project that one finds desirable and the other finds uninteresting. The latter might feel a great deal of demand stress because of a requirement to work on a project perceived as uninteresting, and constraint stress because there is no time available to pursue other areas of research. The former researcher, on the other hand, feels neither of these kinds of stress, because the research is perceived as desirable. There may, however, be a perception of opportunity stress.

Each type of stress was theorized to relate positively to physiological symptoms and cognitive psychological outcomes. It was concluded that opportunity stress relates positively to affective psychological outcomes, such as job satisfaction. Opportunity stress and constraint stress were theorized to have inverted-U relationships with performance, and demand stress a negative relationship with performance. While this is a useful categorization of stress, there are practical difficulties with Schuler's conceptualization, the primary one being that one person's demand could be another's opportunity or constraint. Or a situation could represent each of the three types of stress for the same person at different points in time. Further, this categorization is an oversimplification of the multifactorial nature of stress. Categorization of stress in this manner would likely inhibit explanation and understanding of the complex interactions between the individual and the environment.

McGrath (1976) viewed stress as a potential occurrence "when an environmental situation is perceived as presenting a demand which threatens to exceed the person's capabilities and resources for meeting it, under conditions where he expects a substantial differential in the rewards and costs from meeting the demand versus not meeting it" (p. 1352). This definition is useful in that it recognizes the importance of the individual's perception of the situation as the cause of stress. The notion of rewards and costs also addresses the idea of importance. On the other hand, the specification of demand as the only cause of stress is even more limiting than Schuler's (1980) conceptualization of stress.

Sharit and Salvendy (1982) offered a useful definition of stress as "a multidimensional phenomenon that is reflected in the individual's physiological and psychological responses to a particular situation" (p. 130). This definition is useful because it conceptualizes stress as having several facets or dimensions, it recognizes both the psychological and physiological outcomes for the individual, and it recognizes the influence of the environment.

The use by Sharit and Salvendy (1982) of the term "responses" conveys a partial recognition of the moderating role of the individual. Others have also acknowledged the importance of individual response to a stressful influence. For example, Linn, Linn, and Jensen (1984) found that a person's response to a family tragedy rather than the tragedy itself caused reduced immune system responsiveness. However, the mediating influence of the perceptions of different individuals is not fully articulated by use of the term "responses."

Important elements of the definitions discussed above converge to provide a conceptualization of stress as that which is experienced as stressful by the individual. Based on this review, the following conceptual definition is offered: Experienced stress is the cognitive and affective perception of, and response to, the multidimensional environmental influences that impinge on the individual as being unpleasant or disagreeable and that interact with these perceptions to produce negative psychological and physiological outcomes.

This definition emphasizes the importance of perception and affective response as well as their interaction with environmental influences in the causation of stress. Also recognized is the multidimensional nature of stress and the potential for psychological and physiological outcomes for the individual. Specifically rejected is Schuler's (1980) view of stress as consisting of only constraint, demand, and opportunity, as defined by the situation. Also rejected is McGrath's (1976) view of stress as a demand that may exceed the individual's ability. Adopted is a more general conceptualization of stress as the perception of (McGrath, 1976) and response to (Sharit & Salvendy, 1982) a disagreeable or unpleasant situation. Also included in the present definition of stress is the Sharit and Salvendy (1982) view of stress as multidimensional and as leading to psychological and physiological responses.

The definition developed here provides a more precise and complete picture of stress as experienced stress. Conceiving stress in this manner should enable a greater understanding of mechanisms of the stress process. In order to apply this understanding to future stress research, a model of experienced stress is developed below.

Model of Experienced Stress. Figure 1 depicts the reconceptualized model of experienced stress. The stress process is shown progressing from left to right along the central portion of the model, with individual and environmental moderators at the top and bottom of the figure, respectively. Obviously, the stress process is not necessarily carried through to the end; it can be arrested at any stage. The model is nonrecursive, but feedback loops have been omitted for the sake of clarity and ease of viewing.

The model incorporates elements of earlier models of the stress process from both the organizational and the physiological/medical literature. Previous models that theorized exogenous initial causes of stress specified either environmental influences as the single causal variable (e.g., Kahn & Quinn, 1970; Kahn et al., 1964; Payne, Jick, &

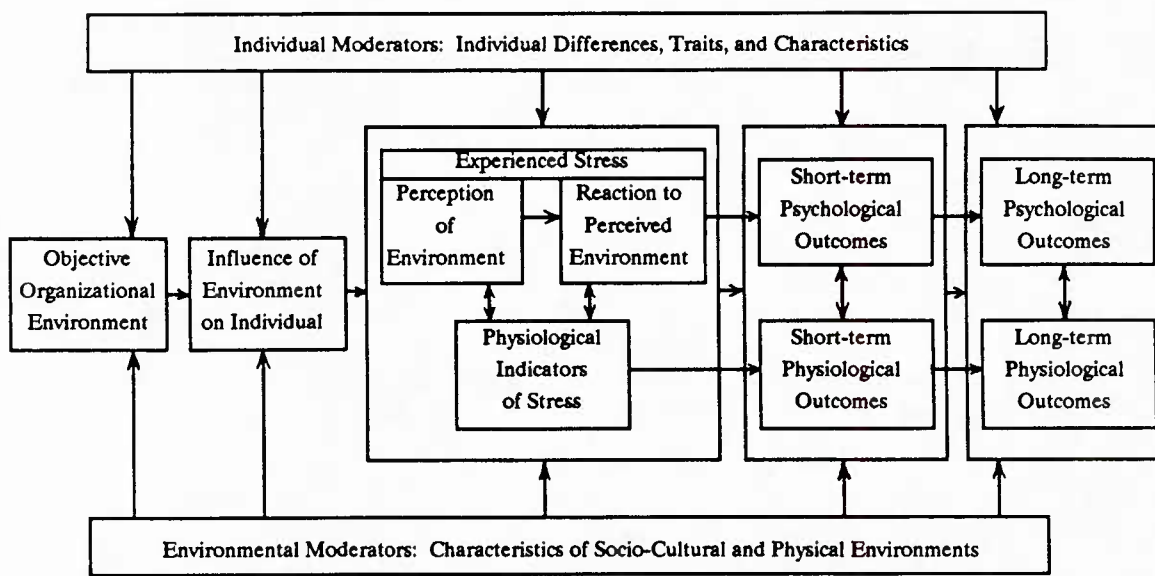


Figure 1. The stress process for the individual in an organizational environment.

Burke, 1982; Salvendy & Sharit, 1982; Schuler, 1982) or both the environment and the individual as causal variables (Beehr & Newman, 1978; Ursin & Murison, 1983).

The logic of researchers specifying both the individual and the environment as initial causes is persuasive. Both elements must be present to initiate the stress process in the individual. However, since the interest here is in experienced stress, which by definition is the perception and response of the individual to environmental influences, inclusion of the individual as a separate cause of stress would be redundant. The entire stress process presupposes the presence of the individual. Therefore, the model in Figure 1 shows only the objective environment as the initial exogenous variable in the development of the stress process. On the other hand, as the model depicts, both individual characteristics and environmental influences moderate the stress process.

A discussion of specific individual and environmental moderators is beyond the scope of this review. However, it is worth noting that social support from one's supervisor, co-workers, or family can be an important environmental moderator of stress (Royle, 1985). Martin and Burks (1985) found that social support physically present at the location of a stressful situation is more effective than social support removed in time and place. In the workplace, this means that supervisor and co-worker support should be more valuable than family support. There is evidence that in some cases social support affects well-being directly, and in other cases it acts through buffering the effects of stress (Abdel-Halim, 1982; Cohen & Wills, 1985; Seers, McGee, Serey, & Graen, 1983).

People do not always derive benefit from social support, however. Sykes and Eden (1985) found that social support did not buffer the relationship between relocating and the stressful effect of the move on the individual. Lefcourt, Martin, and Saleh (1984) found that those with internal locus of control derive more benefit from social support than those with external locus of control. This is paradoxical, in that those with internal locus of control, although deriving more benefit, appear to have less need for social

support (Lefcourt et al., 1984; Royle, 1985). Locus of control may also act more directly in the stress process. Flannery (1984) found that for those with external locus of control, life stress related significantly to measures of illness, whereas internals showed no such relationship.

In one sense, this model is an expansion of the general adaptation syndrome model developed by Selye (1976). Inside the large box in the center of the model, the two boxes labeled "experienced stress" and the box labeled "physiological indicators of stress" equate roughly to the alarm stage. The boxes representing short- and long-term outcomes correspond to the resistance and breakdown stages, respectively.

In contrast to the model presented here, Selye emphasized only the physiological reaction to environmental influences, which reflected his background as an endocrinologist. Industrial engineers (Sharit & Salvendy, 1982) and physiological psychologists (Ursin & Murison, 1983) have provided the same emphasis. Others have instead been concerned with psychological outcomes (Harris & Berger, 1983; Pepitone, 1967). Most researchers, however, have recognized the importance of both physiological and psychological outcomes of the stress process (e.g., Kahn & Quinn, 1970; McMichael, 1978; Payne et al., 1982; Schuler, 1980, 1982). The model shown in Figure 1 follows this dual emphasis of psychological and physiological outcomes. It is important to recognize that the outcomes displayed in the model do not represent stress itself, but rather potential effects of stress.

It is believed that the reconceptualization of stress as experienced stress, coupled with the model depicted in Figure 1, can be a significant aid in future stress research. The following sections provide some areas in which the redefinition and model can be applied to future research.

Stress and Performance

Organizations with employees are by nature productive entities. It is therefore important that the relationship between performance and the various aspects of stress be understood. With such awareness, the job and the work environment can be designed to minimize the dysfunctional effects of stress on performance and performance on stress. The following section discusses some of these relationships.

Stress-Performance Relationships

As alluded to earlier, the way in which a stressful influence is experienced, as either a demand, opportunity, or constraint, may affect the relationship between stress and performance (Schuler, 1980). In addition, individual differences can affect this relationship. Several researchers (e.g., French & Caplan, 1972; Kahn et al., 1964; McGrath, 1976; Schuler, 1980) have concluded that persons with greater ability or experience encounter less stress when performing similar or identical tasks.

Situational differences such as job characteristics have also been linked to stress. Kornhauser (1965) and Frankenhaeuser and Gardell (1976) concluded that stress is positively related to task difficulty and controlled work pace. Buck (1972) concluded that a lack of opportunity to use valued skills and abilities in the work environment could act as a stressor, while Parasuraman and Alutto (1981) concluded similarly that making work more routine is positively related to role frustration.

In specifying the general shape of the relationship between stress and performance, theorists have varied widely in their propositions. Several researchers have found evidence for a negative relationship between stress and performance (e.g., Jamal, 1985; Parasuraman & Alutto, 1984; Smith, 1957). McGrath (1976), on the other hand, concluded that performance has a positive linear relationship with arousal, which can be viewed as an analogue to stress.

Scott (1966), in his review of activation theory, disputed the existence of a positive linear relationship over an infinite range, concluding that performance will eventually decline when activation or arousal exceeds an optimum level. Unfortunately, this optimum level is not easy to determine, since it varies among individuals and with environmental or situational conditions. Schuler (1980) concluded that with an easy or quantitative task the apex of this inverted-U relationship is higher and decreases less in the descending portion of the curve than with qualitative or more difficult tasks. Beehr and Newman (1978) adopted the moderate position that the stress-performance relationship could be a positive linear relationship or an inverted-U relationship, depending on the type of stressor and the type of performance measure.

As discussed earlier, Schuler (1980) divided stress into three types: opportunity, constraint, and demand. He postulated that opportunity stress and constraint stress have a curvilinear relationship with performance, forming an inverted-U pattern, but that demand stress is negatively related to job performance. There are conceptual problems with viewing stress as consisting of only these three facets. In relation to performance, it is unclear whether a single type of environmental stressor can be interpreted as more than one kind of stress by different people, or by the same person under different conditions. And if this is so, under what conditions does one type of stress become another?

In order to engender a greater understanding of the relationship of stress to performance, it is useful to label stress more specifically than Schuler (1980) has done. For instance, Friend (1982) found that performance has a strong negative relationship with workload and time pressure, two elements of stress. Because of this negative relationship, one would assume that Schuler would label workload and time pressure as demand stress. The result would be a loss of clarity as to the nature of the stress. Furthermore, stressors such as time pressure need not necessarily have a negative relationship with performance. In a study of scientists and engineers, Andrews and Farris (1972) found that time pressure yielded several positive results, including increased innovation, improved performance, and greater value to the organization. Is time pressure in one instance demand stress and in another, say, constraint stress? It is not clear how Schuler would answer this question.

One reasonable explanation of the above dilemma is that the individual's perception of, and reaction to, the stressor determines its effects, as discussed in the section defining experienced stress. Friend (1982) explained the negative relationship between performance and time pressure as being due to the problem-solving nature of the task. Alternatively, it could be that the results were due to the fact that the problem-solving task was a test, hence experienced as stressful by the subjects. In contrast, the positive relationship between performance and time pressure found by Andrews and Farris (1972) may have been due to the scientists' and engineers' greater competence and familiarity with the work.

Experienced stress can cause undesirable outcomes for employees. In a large study of workers representative of the Finnish working population (Kauppinen-Toropainen, Kandolen, & Mutanen, 1983), it was found that time pressure and lack of self-determination jointly increased job dissatisfaction and symptoms of work-related exhaustion. On the other hand, Jamal (1985) found that organizational commitment moderates the negative effects of stress on performance.

Boredom, as an aspect of stress, has received the attention of several researchers in recent years. Selye (1976) theorized that understimulation, as well as overstimulation, could be stressful. Similarly, role underload (French, 1974; Sales, 1970) has been considered a stressful condition. Sales (1970) found that subjects in a role underload condition had less job satisfaction than subjects in an overload condition.

Boredom, however, is not universally conceded to be an indicator of stress. In a review of research on boredom and monotony, Thackray (1981) recently concluded that these conditions are not in themselves stressful, in the sense of increased neuroendocrine activity. He concluded that boredom and monotony occur in combination with other aversive stimuli such as the requirement for constant attention or alertness, as in machine-paced work, and that it is the interaction between these two variables that causes physiological stress. Machine-paced work has been found to be a stressor independent of the effects of boredom (Hurrell, 1985).

O'Hanlon (1981) characterized boredom as a unique state involving a broad range of psychophysiological correlates. Kerce (1985), in a review of boredom and job design, concluded that boredom is itself multidimensional, encompassing feelings of fatigue, monotony, constraint, unpleasantness, and distorted time. She also concluded that there are individual differences in susceptibility to boredom. It appeared from her review, however, that situational, or job, variables relate most strongly to the experience of boredom.

In support of Thackray's (1981) conclusion, Sales (1970) found a significantly higher heart rate for subjects in an overload condition than in an underload condition. Harris and Berger (1983) found that psychological stress resulted from overload but not from underload.

It must be recalled, however, that according to the theoretical framework adopted in this study, stress is what is experienced as stressful. Weiman (1977), in a study of more than 1,500 officers in a large financial institution, compared responses to an organizational stress questionnaire with results of physical examinations. The curvilinear relationship described by Selye (1976) was in evidence, with the greatest risk of disease occurring in persons reporting extremely high and extremely low levels of organizational stress. Not only does the relationship conform to Selye's hypothesized curvilinear relationship, it also provides support for a relationship between experienced stress and physiological outcomes of stress.

More than 50 years ago, studies conducted in Great Britain (Wyatt & Fraser, 1929) concluded that boredom is related to decreased output in repetitive industrial work. More recently these findings have been questioned. Smith (1953) found no necessary relationship between boredom and output in a piece-rate clothing mill. Her findings must be viewed with caution, however, because of the influence of a piece-rate incentive system, which caused workers to set daily quotas for themselves. Smith (1955)

found in a later study that those most susceptible to boredom and monotony tend to be young persons with restless energy.

Drory (1982), in a study of truck drivers, replicated the Wyatt and Fraser (1929) findings that boredom is negatively related to work effectiveness. He also determined, perhaps surprisingly, that less capable drivers were more susceptible to boredom than drivers with greater capacity.

Based on this review, a relational model of stress and performance is presented in Figure 2. The stress portion of the model is a segment of the stress process model shown in Figure 1. As the present section of this review indicates, stress and performance are related, although the shape and degree of this relationship is not clear. It appears that this relationship could vary with the job and the individual. Some research has found evidence for the moderating effects of job classifications and individual differences (French et al., 1982).

In addition, the direction of causation is not clearly established. The review indicated that in some cases stressful environmental influences affect job performance, and in other cases the emphasis on performance is stress-inducing. The model in Figure 2 depicts this reciprocal or mutual causation. Although not shown in the model, the reciprocal causation may not always exist, and even when it does, it may not be simultaneous, as cross-lagged research could show. Although the model lacks detail, it provides a useful basis for research into causal and correlational relationships between stress and performance.

In conclusion, it is evident from the review of stress and performance that the relationship between these two variables is anything but settled. Future research should focus on the conditions that modify the relationship between stress and performance, including the job type, individual characteristics, and environmental influences.

Stress During Periods of Critical Activity

Little research has been conducted on the relationship between stress and performance in jobs having short, intense periods of critical activity interspersed with long periods with less demand. Exceptions to this lack of research have been studies of naval aviators' and radar intercept officers' (RIOs) physiological responses to landing aboard an aircraft carrier. Researchers found elevated cortisol stress responses on flying days in the aviators, but not in the RIOs, indicating that the pilot in control exhibits more stress than the RIO (Miller, Rubin, Clark, Crawford, & Arthur, 1970). In addition, there was indication of accelerated metabolism of brain norepinephrine of both pilots and RIOs on flying days (Rubin, Miller, Clark, Poland, & Arthur, 1970). However, these tests were not able to indicate the specific effect of carrier landings on the aircrews, as opposed to the effects of other aspects of flight. The ambiguity was due to the fact that the physiological measures were merely capable of discriminating *between* flying and nonflying days, not between different activities *during* the flying days.

In a more precise test of the effects of critical job events on strain in nurses, Eden (1982) found that systolic blood pressure, pulse rate, and serum uric acid increased in anticipation of these critical job events. Psychological measures of anxiety and qualitative overload also increased.

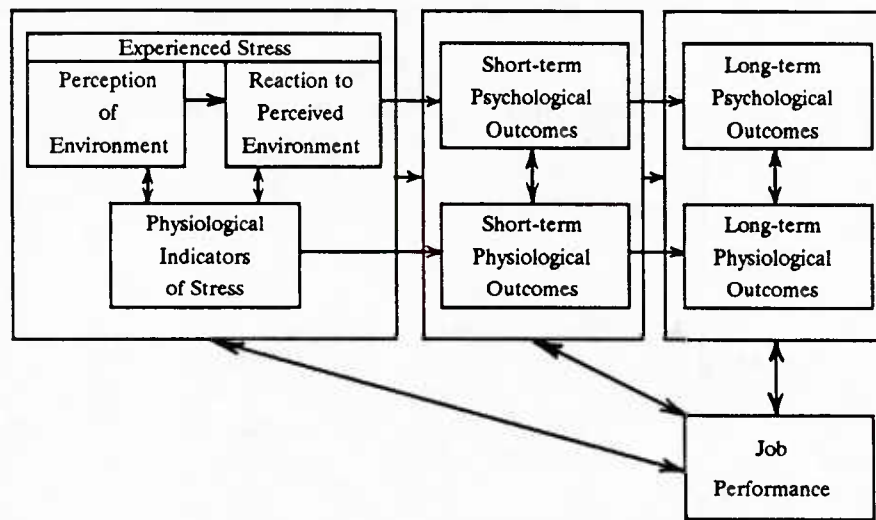


Figure 2. Hypothesized relations between performance and elements of the stress process.

An exploratory study (Keenan & Newton, 1985) used self-report measures with open-ended questions to reveal eight categories of acute stress: time-wasting occurrences, interpersonal conflict, qualitative over-/underload, quantitative over-/underload, employment conditions, role conflict, role ambiguity, and lowered self-esteem. Employees' reactions to acute stress were anger, annoyance, and frustration, while they reacted to chronic stress with worry and anxiety.

It is important to note that the study of acute stress in the workplace has a focus different from research which has related acute stress to major life events. Some life events research has compared the predictive ability of significant life events versus daily stressors to short-term changes in mood (Eckenrode, 1984) and psychological symptoms (Burks & Martin, 1985; Fleming, Baum, & Singer, 1984). In these cases, the daily stressors better predicted mood and stress outcomes than did major life events despite contamination of life events with the illness measures used (Schroeder & Costa, 1984).

Such results are not surprising. Lazarus (1980) has suggested that major life events often bring about lesser daily problems, which, though smaller in magnitude, may have a greater influence on the individual than major life events. The greater influence of daily events may be due to their immediacy, that is, their ever-present influence on the individual. Findings by Eckenrode (1984) support this hypothesis. In a path analysis, he found that life events affected daily mood only indirectly through their effect on daily stressors and daily symptoms. Burks and Martin (1985) found similarly that when daily problems were entered first in a regression equation predicting psychological problems, entering life events as a predictor did not increase the prediction significantly.

In spite of the above findings, it is expected that an examination of periods of critical activity in the workplace will lead to different results. In the first place, work is an instrumental, goal-directed activity. Therefore, for jobs in which the criterion of performance is the individual's ability to respond during periods of critical activity, those acute influences are expected to predict performance better than are daily stressful

influences. Likewise, periods of critical work activity are more likely to predict physiological indicators of stress and outcomes of stress.

Organizational research into acute stress during periods of critical activity needs to be expanded. First, jobs should be identified that are likely candidates for study. Stress measures should be refined in order to better measure this phenomenon. Finally, the effect of stress on performance during periods of critical activity needs to be examined.

Issues in the Measurement of Stress

The experienced stress model presented earlier in this review provides a useful framework for analysis of stress in organizations. Application of this model to the measurement of stress as it relates to performance requires that stress be measurable with reliability and validity. The following discussion of measurement issues indicates, however, that more attention needs to be given to resolving problems with the measurement of stress.

The Relationship of Self-Report Measures to Physiological Indicators of Stress

As the preceding portion of this stress review indicates, most organizational studies of stress have relied largely or exclusively on self-report measures. The relationship of these measures to psychological and physiological stress has received little attention in organizational behavior and psychology literature (Fleming et al., 1984). In order to overcome this deficiency, the remaining sections will attempt to bridge the gap between organizational and psychological literature, on the one hand, and psychophysiological and medical publications on the other. As the heading indicates, this section will review research that relates self-report measures to physiological indicators of stress.

Recall that the model of experienced stress presented in Figure 1 depicted environmental influences as causing both the physiological correlates of stress and the individual's perception and response concurrently. Until more is known about the interrelationships among mental and physiological activities in response to environmental influences, such a representation offers the most reasonable depiction of the stress process. Future research should attempt to determine whether the individual's perception and response actually are concurrent with the physiological indicators.

To reiterate an earlier statement, Cox (1985) argued that there are no physiological measures of stress per se, only physiological correlates or indicators of stress. He stated that stress is not an observable or discrete event, not a physical dimension of the environment, and not a piece of behavior or pattern of physiological response. In other words, none of the observable phenomena we associate with stress are actually the stress itself; they are the correlates or indicators of stress. Human stress is what is experienced as stressful by the individual.

Several years ago, Mason (1968a, 1968b), in extensive reviews, concluded that both the pituitary-adrenal system and the sympathetic nervous system respond to psychological influences. Such psychological influences can be seen as the cognitive and affective responses to stress. However, self-report measures of stress have not been able to measure these psychological influences with high reliability and validity. Eden (1982), in a study of the effects of critical job events, found that anxiety, systolic blood pressure, and serum uric acid rose and fell in conjunction with the critical events, in spite of the fact that a subjective measure of stress did not increase. Such negative

findings could be due to the psychological effects being bypassed, while physiological symptoms register without conscious control (Eden, 1982; Gal & Lazarus, 1975). An alternate explanation could be that self-report measures (Cooper et al., 1987) and physiological measures (Fried, Rowland, & Ferris, 1984) of stress are not sensitive enough to measure the extremes of stress effectively. Finally, there are many potentially confounding factors in the measurement of physiological indicators of stress that are often not statistically controlled in stress studies (Fried et al., 1984).

Bridges and Jones (1973) tested subjects on four self-report psychological stress scales and several physiological measures in response to an oral examination. Plasma corticosteroid increases over baseline measures related to scores on only one scale, the Stimulus-Response Inventory, $r = .46$, $p < .01$ (Endler, Hunt, & Rosenstein, 1962). Subjects' self-estimates of stress levels were positively related to both plasma corticosteroid increases and the Stimulus-Response Inventory. Estimates of stress by an observer were also positively related to plasma corticosteroid increases. There were no significant relationships between any of the stress scales and respiration, pulse rate, or blood pressure.

Harris and Berger (1983) failed to find a relationship between a self-report of stress and an increase in pulse rate among students required to give a classroom presentation. The predictor variable, stress, was computed by multiplying the respondent's perceived discrepancy between difficulty and ability by the importance of good performance. Harris and Berger found a marginally significant relationship between the predictor and reported stress, but no relationship between the predictor and pulse rate increase.

In a laboratory study (Forsman & Lindblad, 1983), a task to increase mental stress produced an increase in heart rate and systolic blood pressure, and increased plasma epinephrine and norepinephrine. Self-reports of subjective effort were higher during the test, but not self-reports of subjective distress. Subjective effort did not relate to any physiological measures. Similarly, Sales (1969a) found that subjects experiencing objective overload had increases in serum cholesterol regardless of their subjective experience of workload.

The above findings suggest that self-report measures of experienced stress exhibit poor reliability and validity in relating to physiological indicators of stress. Further, these relationships, when they do exist, are likely to be moderate to weak. The problem of weak relationships is due not only to reliability and validity problems of self-report measures, but also to reliability problems encountered in measuring the physiological indicators of stress.

More reliable and valid self-report measures of experienced stress need to be developed. However, it is possible that some physiological indicators of stress may not relate to self-report measures under any circumstances (Endler et al., 1962). Thus, it may be that some measures used as physiological correlates of stress occur without any conscious awareness on the part of the individual, as reported in this section (Eden, 1982; Gal & Lazarus, 1975). Alternately, as will be discussed in the next section, it may be that weak interrelationships among the various physiological indicators are part of the problem.

Interrelations Among Physiological Measures

Many elements affect the measurement of physiological indicators of stress. In his review of physiological stress research, Bridges (1974) pointed to research that found effects for weight, height, age, sex, and circadian rhythm in differing physiological responses to environmental stressors. Mason (1959) found that plasma corticosteroid levels are generally elevated with the first blood sample taken, as compared with following blood samples, due to individuals' anxiety over the procedure. Low correlations have also been found between plasma corticosteroids and urinary corticosteroids, due to the fact that urinary levels reflect accumulation over time, while plasma levels are sensitive to short-term physiological changes (Wadeson, Mason, Hamburg, & Handlon, 1963). This difference should be a major consideration when studying jobs with acute periods of critical activity, as opposed to jobs with chronic environmental influences (Fried et al., 1984).

Several researchers have found that different kinds of environmental influences induce differential patterns of physiological response (Lacey, 1967; Mason, 1971; Mikhail, 1981). In addition, several studies have demonstrated that measurements of different physiological indicators generally do not relate highly, and that response patterns across persons tend to be different (Cattell and Scheier, 1960; Frazier, Weil-Malherbe, & Lipscomb, 1969; Lacey & Lacey, 1958).

While different indices of stress or arousal may change in response to a stimulus, their intercorrelations may approach zero. As a result, these measures relate poorly not only to self-report measures of stress but also to behavior (Malmo, 1959) and to specific psychological conditions. Some indices may even correlate negatively; for instance, pulse rate correlates negatively with alpha and beta brain waves. Lacey (1967) found that attention directed externally (to visual and auditory stimuli) resulted in decreased pulse rate, while attention directed internally (mental work) increased pulse rate, in spite of the fact that the former case produced greater respiratory rates.

In addition, a change in one physiological indicator of stress may affect the way in which another physiological measure functions. It appears, for instance, that variations in breathing modulate cardiovascular functioning (Grossman, 1983; Turner & Carroll, 1985), although the relationship is not linear.

Different types of stressful situations may generate similar physiological responses in the individual (Lacey & Lacey, 1958; Speisman, Osborn, & Lazarus, 1961). Conversely, a particular physiological substance may produce different reactions to various stressful stimuli. In a classic study, Schachter and Singer (1962) found that subjects injected with epinephrine will exhibit emotions that match their cognitive appraisals of the situation.

In contrast to Lacey's (1967) emphasis on situational differences, Appley and Trumbull (1977) made a strong case for individual differences in similar situations. In criticizing Lacey's work, they argued that a stimulus of sufficient strength to be universally stressful, as Lacey used, would necessarily reduce the effects of individual differences. It is, they asserted, the stimuli of moderate strength that induce the greatest differentials in response across individuals.

Some researchers (Wenger, Clemens, Coleman, Cullen, & Engel, 1961) have pointed out that physiological response specificity may not be as pervasive as might be expected. Some have seen the connection between psychological and physiological responses as

particular to the individual (Hathaway, Brehm, Clapp, & Bogdonoff, 1969). Malmö (1959) indicated that within-subject designs controlling for the individual basal rates of various physiological measures would demonstrate greater reliability and higher intercorrelations among these measures.

Further links need to be drawn between the research in psychological responses and research concerned with the physiological indicators of stress. These two areas of research have developed essentially independently (Mason, 1975). Such links are inherently difficult to establish, because "most, if not all hormones, characteristically respond to multiple stimuli" (Mason, 1975, p. 27). This factor could explain the weak relationship between self-report measures of experienced stress and physiological correlates of stress discussed in the previous section. If the hormonal response mix is different under different conditions, then the discovery of what types of experienced stress elicit what hormonal mixes in what types of individuals could have important implications for the study of different work situations.

The research reviewed in this section provides evidence that different types of individuals respond with different patterns of physiological responses to identical environmental influences, and that a single individual responds with different physiological response patterns to different environmental influences. Within the context of organizational stress, it would follow that different types of individuals may respond with different physiological response patterns to particular jobs; and these patterns may differ across jobs.

Self-Report Measures of Stress as Predictors of Psychological and Physiological Outcomes

This section will review research relating self-report measures to psychological and physiological outcomes of stress. Referring to the model of the stress process shown in Figure 1, recall that short- and long-range psychological and physiological outcomes can occur as a result of experienced stress.

As stated earlier, Mason (1968a, 1968b) determined that the pituitary-adrenal and sympathetic nervous systems respond to internal psychological processes, which, in turn, are the result of environmental influences. Psychosocial stimuli, as elements in the stress process, have been implicated in the development of several diseases, including coronary diseases, ulcers, thyroid malfunctions, and hypertension (Jenkins, 1976; Kagan & Levi, 1974). A recent review has presented evidence which, though inconclusive, implicates psychosocial stress in the decreased effectiveness of the immune system in fighting infectious diseases, allergies, autoimmune disorders, and cancers (Jemmott & Locke, 1984).

Many articles have supported the view that the work environment is an important element in the development of short- and long-term outcomes of stress. A review by Cooper and Marshall (1976) concluded that work stress is a causal factor in cardiovascular disease and mental illness. Kornhauser (1965) reported that poor mental health is related to unpleasant work conditions and the requirement to work fast. French and Caplan (1972) found that overload produces psychological and physiological symptoms such as job dissatisfaction, job tension, elevated cholesterol levels, increased heart rate, electrodermal response, and more smoking.

In a study of Australian telegraphists and mail sorters, Ferguson (1973) found that dissatisfaction with one's job and supervisor was related to neurosis. In a study of air traffic controllers, Kavanagh, Hurst, and Rose (1981) found through structured interviews that low ratings of work satisfaction and co-worker satisfaction were related to several aspects of psychiatric symptoms, such as subjective distress and impulse-control disturbance. After controlling for age, alcohol consumption, smoking, body mass, and family history of hypertension, job dissatisfaction was found to relate to high blood pressure (Matthews, Cottington, Talbott, & Kuller, 1983).

In a large study of blue collar workers at a rubber, plastics, and chemicals manufacturing plant (House et al., 1979), 12 self-report measures of perceived stress were compared with five self-report symptoms of ill health and five medical conditions. Although correlations were low, perceived stress variables generally correlated with self-report symptoms (angina pectoris, ulcers, neurosis, itch and rash, and cough and phlegm). Self-report measures of role conflict, high workload, low job satisfaction, and low intrinsic and extrinsic rewards correlated with the medical diagnosis of hypertension. Low job satisfaction and low intrinsic and extrinsic rewards correlated with increased incidence of coronary heart disease.

House et al. (1979) further found an interaction between perceived stress and chemical irritants associated with the work that produced self-report symptoms of cough and phlegm, and rash and itch. Perceived stress and chemical irritants did not interact, however, to produce medically diagnosed symptoms. As these researchers stated, while the self-report nature of some of the physiological measures requires some caution in interpreting the results, there appeared to be a clear relationship between perceived stress and psychosomatic illnesses.

Additional evidence of this relationship between self-report measures and psychosomatic indicators of stress was found by Stuart and Brown (1981). In a study of college students, these researchers obtained self-reports of stress, diseases, and accidents. They found a significant relationship of reported stress to diseases and accidents.

Parkes (1982) sounded a note of caution relevant to some of the studies relating self-report measures to physiological stress. He suggested that correlations between perceptions of the work environment and mental health may be artificially high due to the tendencies of some to exaggerate their complaints. Alternately, the correlations could be high because perceptions of the environment and both mental and physical health are interdependent (Lazarus et al., 1985). The question remains, however, whether such indications of experienced stress are reflected in what Parkes (1982) referred to as "diagnosable medical conditions" (p. 785).

While the possibility of contamination of predictor and criterion measures suggests caution in interpreting the above findings, the growing evidence suggests nevertheless that the stress process is a causal factor in the development of short- and long-term psychological and physiological illnesses and diseases. However, more work needs to be done to develop self-report stress measures that reduce the contamination of predictor and criterion scores.

In concluding this review, it should be noted that Figures 1 and 2 provide models for research aimed at clarifying the organizational stress process. These models give some indication of the complexity of stress in organizations. And while the elimination of unnecessary and dysfunctional elements of organizational stress may be difficult, such

elimination would serve the interests of organizations and their employees alike. Matteson and Ivancevich (1979), in their review, admonished that management's responsibility does not end with the obligation to improve performance; there is also the implicit obligation to provide an environment that reduces the probability that the negative outcomes of stress can occur.

CONCLUSIONS

Based on the above literature review, the following conclusions can be drawn:

1. Stress is a multivariate phenomenon that assumes an interplay between the environment and the individual. Evidence indicates that stress is a function of the individual's perception of, and affective response to, environmental influences. That is, stress for the individual is what is experienced as stressful.

2. Role stress, although a useful concept in the study of organizational stress, is limiting in that the sources of stress other than role are ignored. The emphasis of role stress to the exclusion of other sources of stress may provide a misleading and incomplete picture of the multivariate influences of stress on the individual in the organizational environment.

3. Person-environment fit is a highly useful concept for the study of organizational stress because it denotes a good or poor match between the individual and the environment. When this concept is combined with the concept of experienced stress, a person-environment mismatch indicates an increased probability that the individual will experience the environment as stressful. Although this concept is plagued by statistical difficulties as presently operationalized, it merits further development.

4. Stress may exhibit different relationships with performance, depending on the type of stress, the type of performance, and the ability of the individual to perform a particular task. Since each job may have a unique stress-performance relationship, stress and performance must be examined in particular jobs to determine that relationship. In addition, individual differences must be measured to discover how they modify the relationship.

5. Stress as measured by self-report questionnaires has been shown to relate poorly to the physiological correlates or indicators of stress. The weak relationship is due not only to the low reliability and validity of self-report measures but also to the poor reliability of physiological measures.

6. Self-report measures have implicated occupational stress in the development of physical and mental illness. However, some self-reports of occupational stress are suspect because they may be contaminated with self-reports of symptoms and illnesses.

7. An individual's physiological responses to stress vary, depending on the types of stress encountered and the characteristics of the individual. It appears possible that typologies or profiles of physiological responses to stress could be developed to define individuals by their: (a) patterns of physiological responses to particular types of stress--for example, to particular jobs; (b) patterns of physiological responses to specific environmental influences; (c) short-term disease or illness symptoms as a result of the adaptation to stress; and, (d) over the long term, tendency to contract diseases such as rheumatoid arthritis, gastric ulcers, cardiovascular ailments, and cancers.

RECOMMENDATIONS

Obviously, more stress research should be conducted in the Navy and other military activities, in other government activities, and in private industry. Based on this review, it appears that there are several research avenues that need to be pursued.

For the study of organizational stress, research should be undertaken to:

1. Develop a method to measure and quantify stress in particular jobs and organizational environments.
2. Identify whether the stress experienced by the individual is the result of the day-to-day pressures of the job or whether it is due to the need to respond to relatively short, intense periods of critical activity.
3. Determine the functional relationships between stress and performance in particular jobs identified as stressful.
4. Determine the moderating or buffering effects of individual differences and organizational influences on the relationship between stress and performance.
5. Identify the adaptive measures that organizations take to reduce the experience of stress by their personnel.
6. Identify the methods individuals use to cope with experienced stress.
7. Investigate methods of eliminating or reducing dysfunctional stress on the job, and develop prescriptive recommendations for organizations and individuals.

In the area of stress measurement the following steps are recommended:

1. Develop more reliable and valid stress measurement instruments. These measures will have to be individually tailored to tap the stressful elements of specific jobs or situations. In order for this tailoring to be accomplished, detailed knowledge of the situation or job and the stress-inducing environmental influences will be required. Indicators of the validity of these instruments would be their ability to relate to physiological measures and their ability to predict various kinds of illness and disease without contamination between the predictor and the criterion variables.
2. Develop stress scales to measure person-environment fit with greater reliability and validity, using the concept of experienced stress as a guide for development.

Investigation into physiological indicators of stress should include the following:

1. Perform more research in measuring the physiological indicators of stress in the work environment. Research should relate these measures to particular job elements and specific individuals. A typology or profile should then be developed of the various kinds of physiological responses individuals can make in response to specific tasks.
2. Develop typologies of physiological indicators of stress that can predict illnesses and diseases. The predictive validity of these typologies should be investigated in longitudinal, prospective studies.

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APPENDIX
STRESS LITERATURE REVIEWS

STRESS LITERATURE REVIEWS

Journals and books abound with reviews on the subject of psychological and physiological stress within an organizational environment. A number of them are listed below.

Appley, M. H., & Trumbull, R. (Eds.). (1967). *Psychological stress: Issues in research*. New York: Meredith.

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